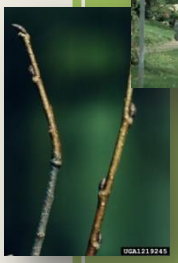
Elm



American elm*: Ulmus americana*
Slippery elm*: Ulmus rubra*
Rock elm: *Ulmus thomasii*

American elms have been decimated by Dutch elm disease which was brought from Europe in the 1930's. However, the **volume of elm has shown signs of recovery** since 1996 with increased growth rates and increased numbers of small trees**.**

Unfortunately, **mortality remains quite high** and has increased in the last 12 years. Elm accounts for less than 2% of all volume and growth of trees in Wisconsin, but 10% of total mortality.

Elm is **not an important timber species**, and is mainly used for fuelwood and pulpwood. It's prevalence in southern Wisconsin may make it a valuable species for biofuel production.

- *How has the elm resource changed?*
  Growing stock volume and diameter class distribution: 1983, 1996, and 2012
- *Where does elm grow in Wisconsin?*
  Growing stock volume by region with map
- *How fast is elm growing?*
  Average annual net growth by region and year: 1983, 1996, and 2012
- *How healthy is elm in Wisconsin?*
  Average annual mortality: 1983, 1996, and 2012
- *How much elm do we harvest?*
  Roundwood production by product and year: 1997, 2003, and 2009
- *How much is elm selling for?*
  Prices for cordwood and sawtimber: 2000 to present
- *How much elm biomass do we have?*
  Aboveground carbon by region of the state: 2012

"How has the elm resource changed?"

Growing stock volume and diameter class distribution by year

The volume of elm in Wisconsin in 2012 was about 339 million cft or 1.6% of total growing stock volume (Chart 1). The vast majority (78%) of this is American elm with 21% slippery elm and less than 1% rock and Siberian elm.

Volume decreased 38% between 1983 and 1996 (Chart 2), mainly due to mortality related to Dutch elm disease, but has increased 32% since 1996, especially in larger size trees (over 13 inches).

The number of sapling, poles, and sawtimber size trees has increased for most elm species since 1996 (Chart 3). Seedling numbers have decreased.

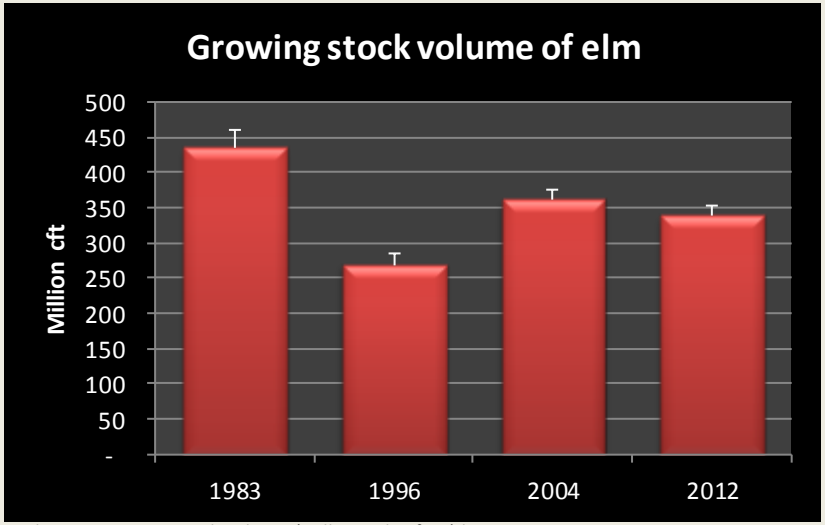


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

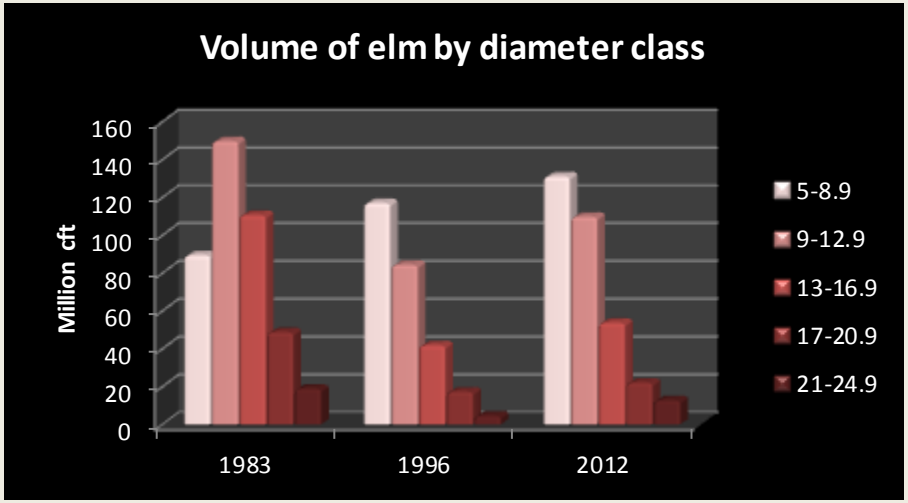


Chart 2. Growing stock volume (million cubic feet) in 1983, 1996, and 2012.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2012.

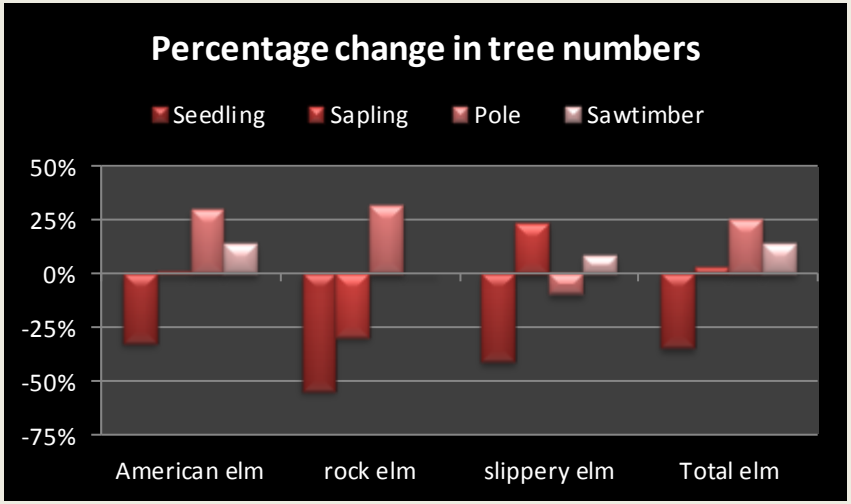
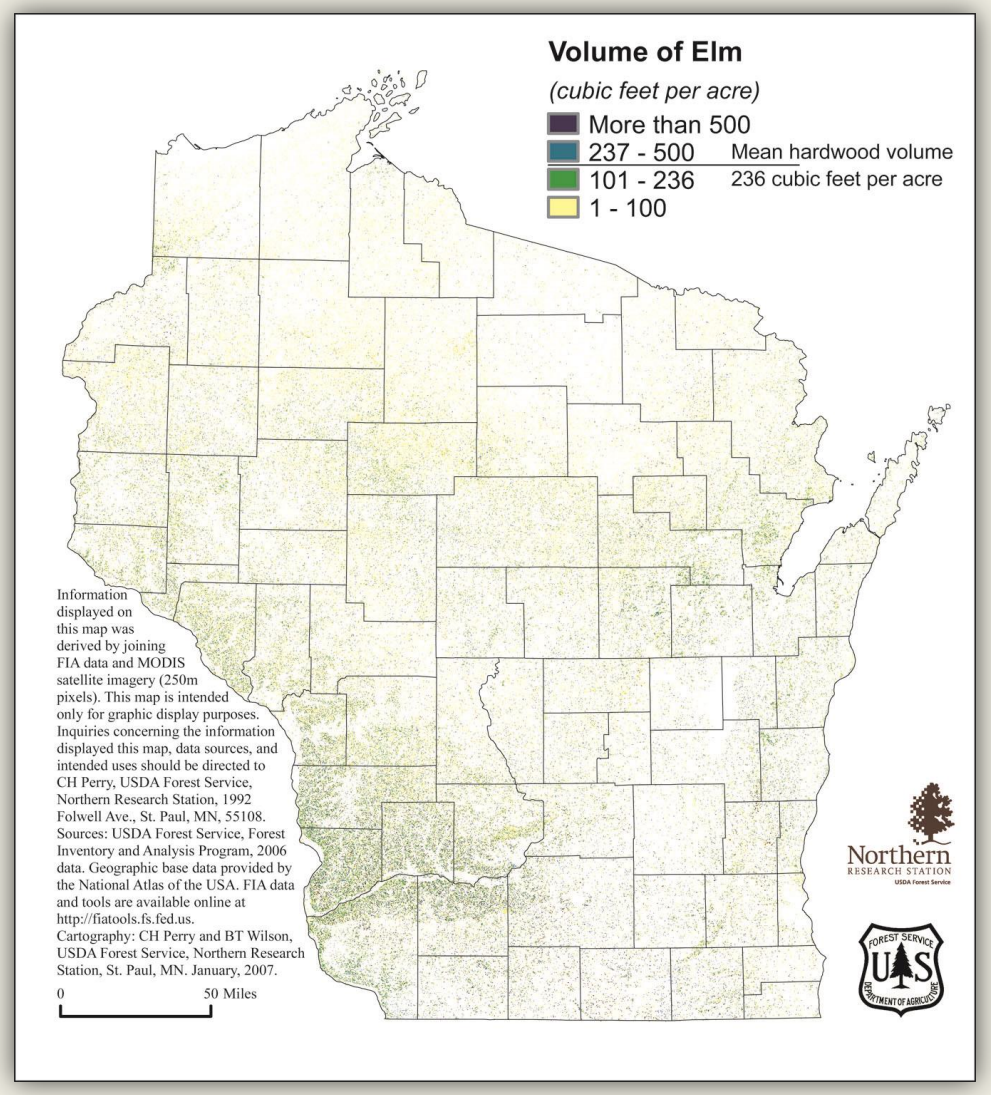


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2012.
Source: USDA Forest Inventory and Analysis data 1996, and 2012.

"Where does elm grow in Wisconsin?"

Growing stock volume by region with map



Elm is a southern species with about ⅔ of volume located in southern Wisconsin and another 15% in the central part of the state.

American and slippery elm are found primarily in the oak-hickory forest type and, to a lesser extent, in bottomland hardwoods. Rock elm is largely found on the maple-basswood forest type.

Table 1. Growing stock volume (million cft) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total	Percent of total
American Elm	42	28	37	58	100	264	**78%**
Rock Elm	0	2	0	-	0	2	**1%**
Siberian Elm	2	-	0	2	1	6	**2%**
Slippery Elm	3	2	2	11	50	67	**20%**
Total elm	**47**	**31**	**39**	**71**	**150**	**339**	**100%**
Percent of total	**14%**	**9%**	**12%**	**21%**	**44%**	**100%**	

Source: USDA Forest Service, Forest Inventory and Analysis 2012 data

For a table on **Volume by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf

"How fast is elm growing?"

Average annual net growth by region and year

Average annual net growth of elm has decreased significantly since 1996. From 2008 to 2012, growth was about 1.0 million cft/year (Chart 4). This represents 0.2% of statewide volume growth.

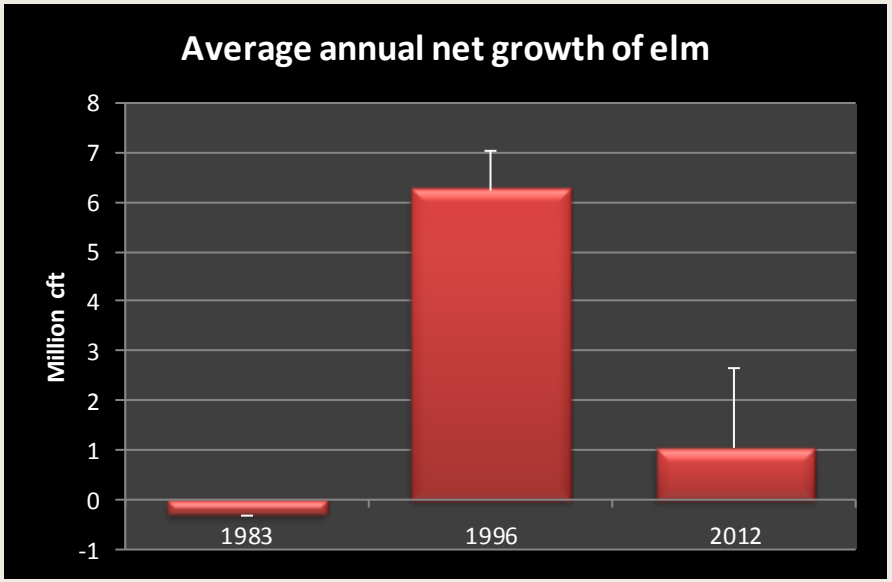


Chart 4. Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012

Table 2. Average annual net growth (million cft/year) of growing stock and the ratio of growth to volume by region of the state.

Region	Net growth	Ratio of growth to volume
Central	0.5	**1.0%**
Northeast	0.1	**0.4%**
Northwest	1.7	**4.3%**
Southeast	-0.4	**-0.5%**
Southwest	-0.9	**-0.6%**
Statewide	**1.0**	**0.3%**

Source: USDA Forest Inventory and Analysis 2012

Although southwest Wisconsin has the highest percentage of elm volume, the ratio of growth to volume is lowest in this part of the state (Table 2). This is mostly due to high mortality rates. The ratio of growth to volume for elm is 0.3%, much lower than the 2.6% for all species in the state.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How healthy is the elm resource in Wisconsin?"

Average annual mortality: 1983, 1996, and 2012

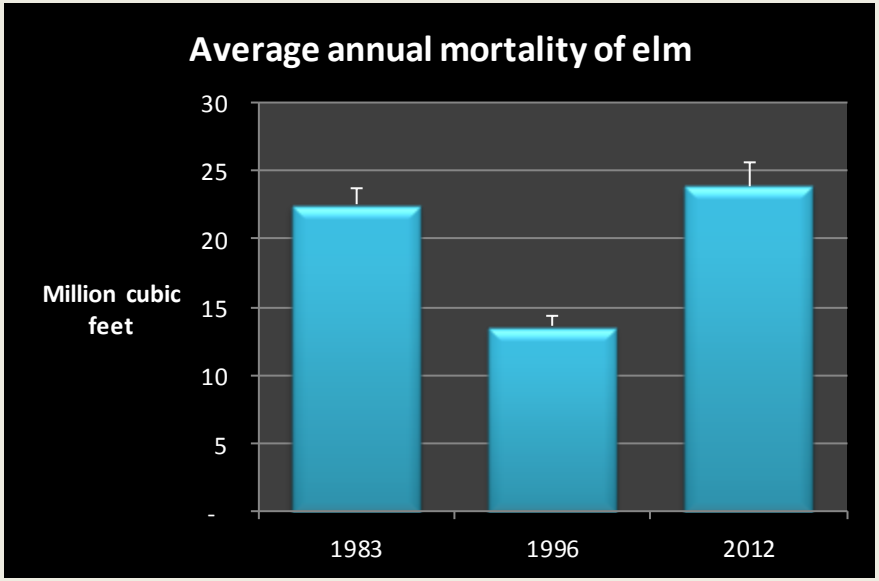


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2012

Average annual mortality of elm, about 23.9 million cft per year, has almost doubled since 1996 (Chart 5).

The ratio of mortality to gross growth is about 97% for elm and is surpassed only by paper birch (Table 3). This ratio is **over three times as high as the average for all species** which is 29.1%.

Table 3. Mortality, gross growth and the ratio of mortality to gross growth.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality / growth
American Elm	20,205,835	21,226,439	**95.2%**
Rock Elm	62,995	143,657	**43.9%**
Slippery elm	3,628,795	4,122,986	**88.0%**
Total elm	**23,904,347**	**24,933,479**	**95.9%**

Source: USDA Forest Inventory and Analysis data: 2012

Whereas elm accounts for 1.6% of volume and 0.2% of net growth, it makes up 10.1% of total mortality statewide. This high mortality is probably due to the continuing affect of Dutch elm disease.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much elm do we harvest?"

Roundwood production by product and year

In 2009, Wisconsin produced about 5.9 million cft of elm roundwood or about 1.6% of total statewide product (Chart 6). The vast majority (74%) was for fuelwood and 22% was in pulpwood.

From 2003 to 2009, elm pulpwood production decreased by 25% and sawlog production fell by 87% but the production of fuelwood more than doubled.

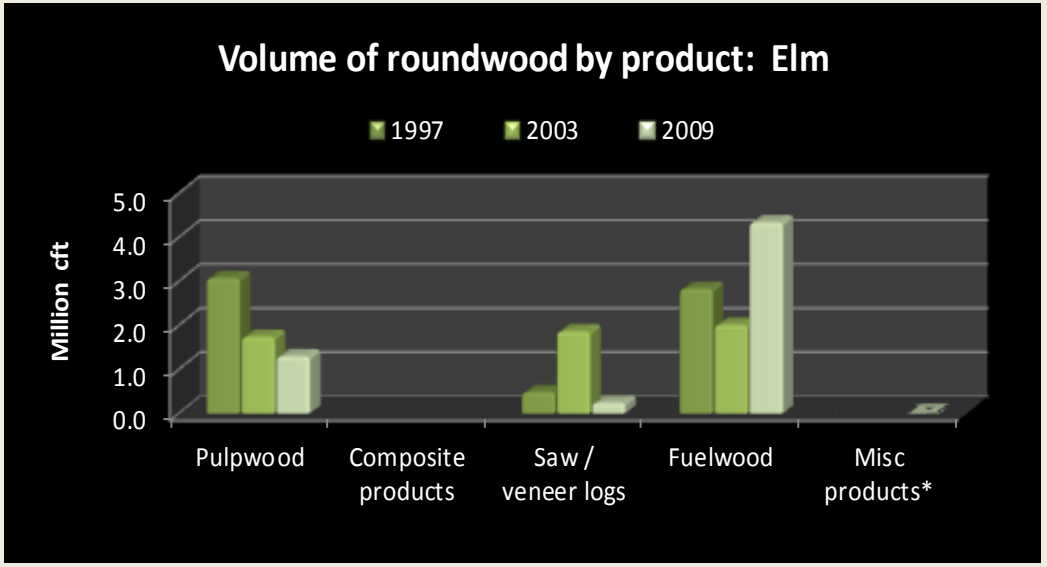


Chart 6. Volume of roundwood products. * Miscellaneous products include poles, posts, and pilings.
Source: Ronald Piva, USDA Forest Service, Northern Research Station, St. Paul MN

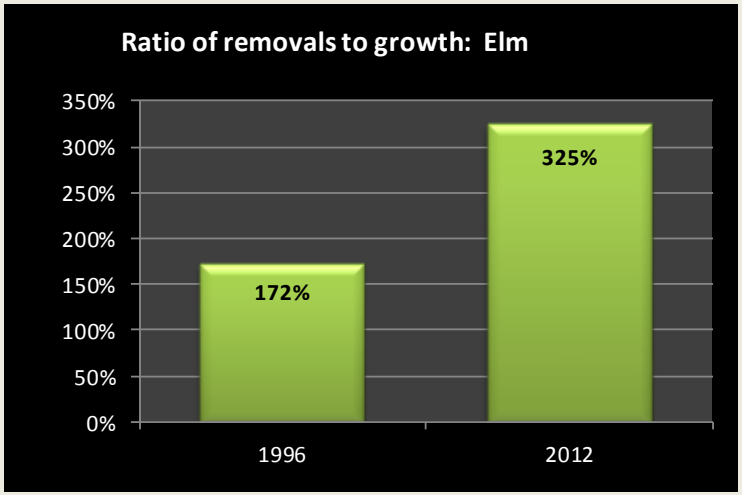


Chart 7. Ratio of volume harvested annually to net growth. 1983 data is not included as growth was negative (i.e. mortality exceeded growth).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2012.

The ratio of removals to growth is 325% (Chart 7), mainly because net growth is almost zero. Average annual removals for the period 2008 to 2012 were only 3.4 cft/year down 68% since 1996. Removals for elm make up about 1.1% of statewide removals.

For a table of **Average annual growth, mortality and removals by region** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf

"How much is elm selling for?"

Prices for cordwood and sawtimber: 2000 to present

There is substantial variability in timber prices from region to region. The prices reported here are the the weighted average stumpage prices (Chart 8) from Wisconsin Administrative Code Chapter NR46.

Sawtimber prices, although quite high in 2006, have otherwise decreased since 2001 (Table 4). Prices for logs are much lower than the statewide average for hardwoods.

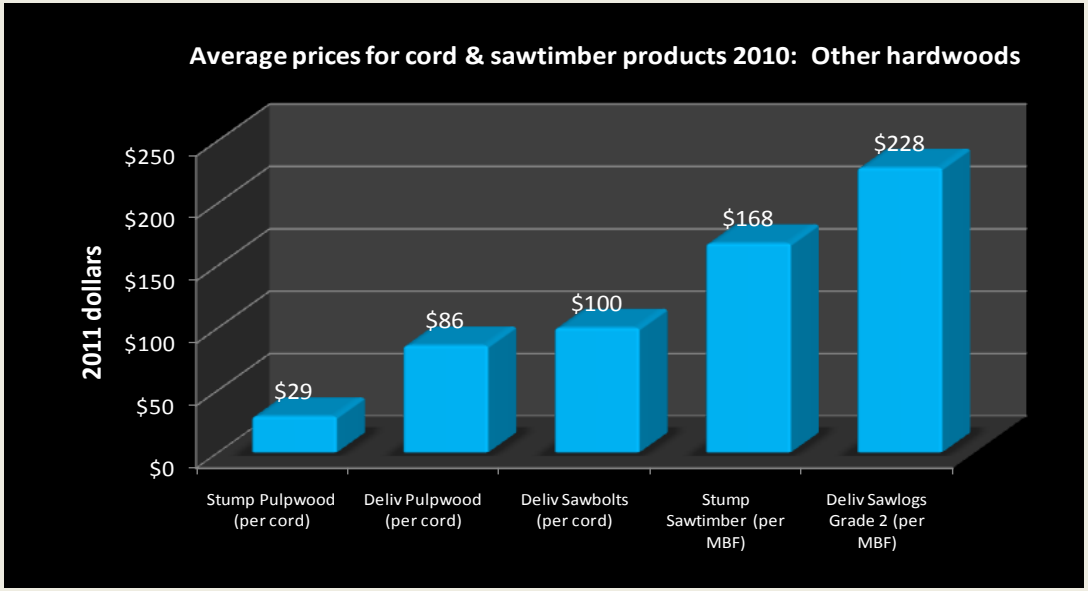


Chart 8. Average prices for cordwood and sawtimber.
Source: Wisconsin Administrative Code Chapter NR46, 2000 to 2012

Table 4. Average weighted stumpage prices (adjusted for inflation to 2012 dollars) by year for Wisconsin.

Product	2000	2001	2002	2003	2004	2005	2006	2008	2009	2012	Average for all hardwoods
Cordwood (per cord)	NA	NA	$12	NA	$6	$7	NA	$11	$24	**$21**	$19
Logs (per MBF)	$123	$108	$121	$78	$102	$45	$98	$101	$95	**$77**	$148

Source: Wisconsin Administrative Code Chapter NR46, 2002 to 2012. The stumpage values calculated each year are for the sole purpose of assessing MFL yield and FCL severance taxes, not for determining the price that should be received for timber.

"How much elm biomass do we have?"

Oven-dry tons by region of the state

There were 13.1 million short tons of biomass in live elm trees in 2012, mostly unchanged from 1983. This is equivalent to approximately 6.5 million tons of carbon and represents 2.1% of all aboveground carbon statewide. As with volume, most of the ash is located in northwest Wisconsin (Chart 9).

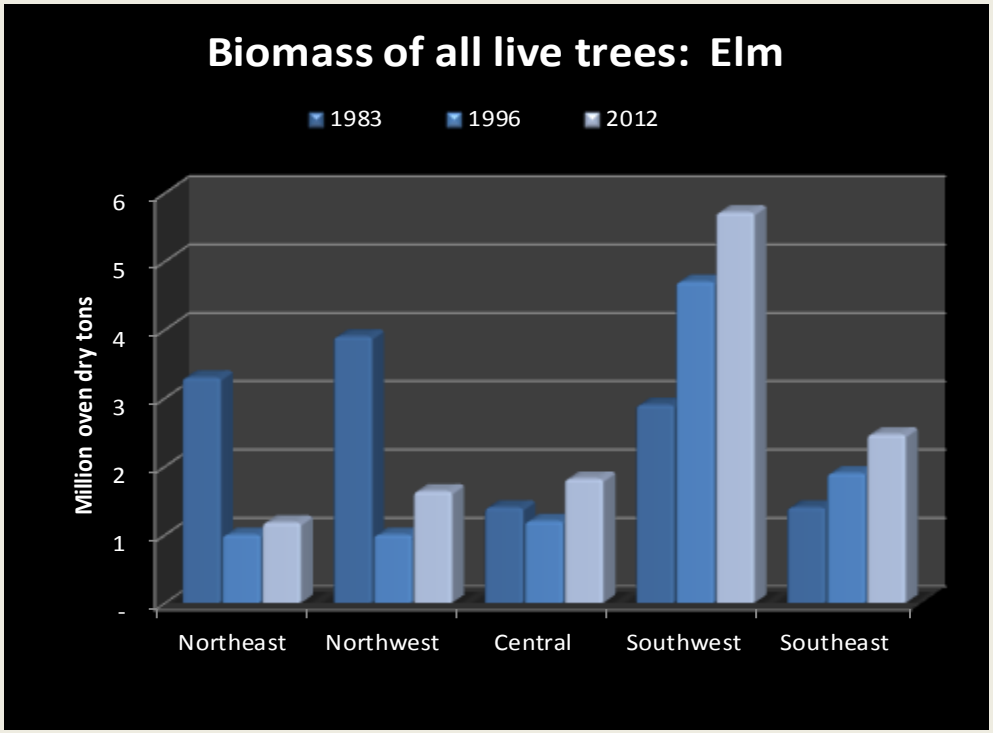


Chart 9. Biomass (million oven-dry tons) by year and region.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2012

Elm has a slightly lower density than other commercial hardwood species in Wisconsin, with a ratio of biomass to volume of 47.9 oven-dry lbs. per cubic foot (ODP/cft). The average for all hardwoods is about 50.1 ODP/cft and for all trees is 46.8 ODP/cft.

Approximately, 73% of all elm biomass is located in the main stem and 22% in the branches.

For a table of **Biomass by County for 2012** go to:
http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf